

### CLAIMS

1. A multi-channel sound reproduction system for testing hearing and hearing aids comprising:
  - at least one audio source;
  - an audio signal processing system for receiving a plurality of audio signals from the audio source and for generating therefrom a plurality of processed audio signals;
  - a listening position at which a test subject is placed; and
  - a plurality of loudspeakers placed about the listening position, the plurality of loudspeakers for receiving at least a portion of the plurality of processed audio signals and for converting those processed audio signals received into a combination of sounds that produce at the listening position acoustic elements typical of a real acoustic environment.
2. The multi-channel sound reproduction system of claim 1 wherein the plurality of loudspeakers are placed and oriented arbitrarily about the listening position.
3. The multi-channel sound reproduction system of claim 2 wherein placed and oriented arbitrarily about the listening position comprises a configuration in which the loudspeakers face different directions relative to each other and relative to the listening position.
4. The multi-channel sound reproduction system of claim 1 wherein one of the plurality of processed audio signals represents a target signal and a remainder of the plurality of processed audio signals comprise multiple interfering noise signals.

- 34 -

5. The multi-channel sound reproduction system of claim 1 wherein the audio signal processing system comprises an audiometer controlled system.

6. The multi-channel sound reproduction system of claim 1 wherein all but one of the plurality of processed audio signals comprises discrete adjusted versions of the plurality of audio signals and wherein the one of the plurality of processed audio signals comprises a combination of the plurality of audio signals.

7. The multi-channel sound reproduction system of claim 6 wherein one of the plurality of loudspeakers comprises a subwoofer, and wherein the one of the plurality of processed audio signals is received by the subwoofer.

8. The multi-channel sound reproduction system of claim 6 wherein the combination of the plurality of audio signals is comprised of an equal proportion of the plurality of audio signals.

9. The multi-channel sound reproduction system of claim 1 wherein the plurality of loudspeakers are placed at locations that are approximately equidistant from a center of the listening position, and wherein the plurality of loudspeakers are facing the center of the listening position.

10. The multi-channel sound reproduction system of claim 9 wherein the audio signals are representative of recordings made by a plurality of microphones that are placed at locations relative to a recording position that correspond to the locations of the plurality of loudspeakers relative to the listening position, the plurality of microphones during recording

- 35 -

facing away from a center of the recording position, the recording position being located in an environment having sounds desired to be reproduced at the listening position.

11. The multi-channel sound reproduction system of claim 9 wherein at least two of the plurality of loudspeakers generate sound that appears to, but does not, emanate from another of the plurality of loudspeakers.

12. The multi-channel sound reproduction system of claim 9 wherein the at least one audio source is calibrated by generation of a pre-determined sound pressure level at a calibration point located at or near the listening position.

13. The multi-channel sound reproduction system of claim 1 further comprising a plurality of audio power amplifiers for receiving the plurality of processed signals and for amplifying the plurality of processed audio signals.

14. A multi-channel sound reproduction system for testing hearing and hearing aids comprising:

- at least one audio source;
- a listening position at which a test subject is placed;
- a plurality of loudspeakers located at approximately ear level of a test subject in the listening position, the plurality of loudspeakers for receiving a plurality of audio signals from the audio source;
- a first further loudspeaker located at approximately ear level and at front and center of a test subject in the listening position, the first further loudspeaker for receiving a further audio signal from the audio source;

- 36 -

a second further loudspeaker located at an overhead center position above the test subject in the listening position; and

the at least one audio source transmitting a time-offset or delayed sum of at least a portion of the plurality of audio signals and the further audio signal to the second further loudspeaker.

15. The multi-channel sound reproduction system of claim 14 wherein the sum comprises an equal contribution from each of the plurality of audio signals and the further audio signal.

16. The multi-channel sound reproduction system of claim 14 wherein the at least one audio source comprises a 5.1-channel storage medium.

17. The multi-channel sound reproduction system of claim 14 wherein the plurality of loudspeakers comprises four loudspeakers located at each of four corners relative to the listening position.

18. The multi-channel sound reproduction system of claim 14 further comprising a subwoofer located proximate the listening position.

19. The multi-channel sound reproduction system of claim 18 wherein the at least one audio source transmits a low-pass filtered sum of at least a portion of the plurality of audio signals and the further audio signal to the subwoofer.

20. The multi-channel sound reproduction system of claim 14 wherein the plurality of audio signals comprises competing signals.

- 37 -

21. A method of testing hearing and hearing aids comprising:
- recording sounds of an acoustic environment via a plurality of microphones placed about and facing away from a recording position;
  - storing the sounds recorded by each of the plurality of microphones as audio signals in an audio source;
  - recording speech;
  - storing the recorded speech as a target signal in the audio source;
- and
- reproducing, from the stored target signal and the stored audio signals and via a plurality of loudspeakers placed about and facing into a listening position, sounds representative of the speech and of the acoustic environment at the listening position.
22. The method of claim 21 further comprising combining at least a portion of the audio signals and the target signal before reproducing sounds representative of the speech and of the acoustic environment at the listening position.
23. A multi-channel sound reproduction system for testing hearing and hearing aids comprising:
- at least one audio source;
  - a listening position at which a test subject is placed; and
  - a plurality of loudspeakers placed about the listening position,
- the plurality of loudspeakers for receiving audio signals from the audio source, at least two of the plurality of loudspeakers generating sound from at least a portion of the audio signals which appears to, but does not, emanate from at least one other of the plurality of loudspeakers.

- 38 -

24. A multi-channel sound reproduction system for testing hearing and hearing aids comprising:

at least one audio source;

a listening position at which a test subject is placed; and

a plurality of loudspeakers placed at locations that are approximately equidistant from and facing toward a center of the listening position, the plurality of loudspeakers for receiving audio signals from the audio source, the audio signals being representative of recordings made by a plurality of microphones that are approximately equidistant from and facing away from a center of a recording position, the recording position being located in an environment having sounds desired to be reproduced at the listening position.

25. The multi-channel sound reproduction system of claim 24 wherein a distance between each of the plurality of loudspeakers and the center of the listening position is approximately the same as a distance between each of the plurality of microphones and the center of the recording position.